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(19)



### (54) DISC BRAKES

(71) We, GIRLING LIMITED, a British Company, of Kings Road, Tyseley, Birmingham 11, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to disc brakes of the type in which the disc comprises a hub and a pair of braking surface providing annular members slidable on the hub, which members are gripped during braking between brake pads.

The brake pads are engaged with the members by hydraulic cylinders which are opposed to each other in the halves of a fixed housing.

According to the present invention there is provided a disc brake comprising a rotor and a fixed housing straddling the rim of the disc, the rotor comprising a hub slidably bearing a pair of braking surface providing annular members which are non-rotatable relative to the hub and the housing having a pair of opposed hydraulic cylinders, in which brake a brake pad assembly disposed between said pair of annular members and a pair of brake pad assemblies disposed between a respective cylinder and a respective one annular member are each mounted for sliding movement relative to the housing so that on actuation of the cylinders the pad assemblies are applied to the annular members and in which brake stops limit the pad applying travel of the pistons in said cylinders.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:—

Figure 1 is a cross-section through a disc brake with part of the disc broken away, and

Figure 2 is a cross-section similar to that of Figure 1 but of a second embodiment.

In Figure 1, a disc brake has two hydraulic pistons 2 slidable in opposed cylinders 3 in a fixed housing. Two annular

members 4 carried on a rotatable hub 5 form a disc of the brake. This disc rotates as one but the annular members 4 are non-rotational but slidable on the hub by means of splines 6 or other non-circularity of the hub and of the annular members. Each annular member provides two braking surfaces 7 and 8. Braking surface 7 is the outermost surface; that is the surface presented to the pistons 2, and the surface 8 is the inner-most of the two surfaces.

Guide pins 9 extend across the brake transversely, that is, perpendicularly, to the annular members and carry brake pads for sliding movement therealong. There are a pair of outer-most pads 10, each acted on by a respective piston 2, which are thus hydraulically displaceable pad assemblies, and a single central pad 11 slidable along the guide pins 9 as a result of being urged so to do by the pads 10 and not being hydraulically displaceable on its own account. This pad can only fairly be described as the pad assembly between the annular members.

The amount of sliding of the pad 11 along the pins 9 is limited by complementary abutments on a backing plate 12 of the pad 11 and projections 14 fixed in the brake's housing.

It will be appreciated that if one of the pistons sticks in its cylinder, braking still takes place even though it involves a single one of the annular members without there being any risk of the operating piston being expelled from its cylinder.

The construction of Figure 2 is similar and the same reference numerals are used to denote similar components.

The sliding of the pad 11 on the guide pins 9 is however limited by constraints on the pistons 2. Each piston has a groove in which fits a split ring 16 and each cylinder is formed with an inner larger diameter part 17 defining a shoulder 18 which the ring abuts when the piston has been driven out to the maximum travel without over-driving. The split ring and its groove are of course

designed to allow the ring to be closed up when inserting the piston in its cylinder.

WHAT WE CLAIM IS:—

- 5 1. A disc brake comprising a rotor and a fixed housing straddling the rim of the rotor, the rotor comprising a hub slidably bearing a pair of braking surface providing  
10 annular members which are non-rotatable relative to the hub and the housing having a pair of opposed hydraulic cylinders, in which brake a brake pad assembly disposed between said pair of annular members and  
15 a pair of brake pad assemblies disposed between a respective cylinder and a respective one annular member are each mounted for sliding movement relative to the housing so that on actuation of the cylinders the pad  
20 assemblies are applied to the annular mem-

bers and in which brake stops limit the pad applying travel of the pistons in said cylinders.

2. A disc brake according to claim 1 wherein each piston and the corresponding cylinder have complementary stop means forming the respective stop. 25

3. A disc brake according to claim 1 wherein the first mentioned pad assembly co-operates with the stops which limit its travel and thus the travel of the pistons. 30

4. A disc brake substantially as herein described with reference to Figure 1 or Figure 2 of the accompanying drawings.

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